REMARKS/ARGUMENTS

In response to your letter please found after our remarks/arguments.

This application is a new method to manage energy in order to power an electrical vehicle (30). The energy is managed through super capacitors (61) and a computer (85) constituing the onboard energy management system. A vehicle goes through four different phases: acceleration (Phase 1), cruising (Phase 2), braking (phase 3) and stop at the station (phase 4). During phase 2 and 4 the super capacitors are storing the energy supplied by the external power source (10). During phase 3 the super capacitors are storing the energy supplied by the external power source (10) and the energy released by the vehicle during braking through traction motor (71) and its electrical converter (72). Unlike any other inventions, in this application, the total of these energies (energy from phase 2 + energy from phase 3 + energy from phase 4) is used/managed, at the proper time, as is, or in addition to the external power source (10), in order to power the vehicle during the accelerating phase (phase 1). By adding all these energies together and to the external power source, the total level of energy reached is significantly higher that the energies described in the prior art, allowing to power powerful vehicles, with reduced external power supply.

For example, this application can power a tramway traction motor (71) of 800kW nominal power with an only 150kW external power supply source (10).
Please see page 9 - line 21 to page 11 - line 36 and Figures 2a, 2b and 2c.

The vehicle goes from a station to the next station with a phase of starting (phase 1), a phase of cruising (phase 2), a phase of braking (phase 3) and a phase of stop at the station (phase 4). We are calculating the energy needed during phase 1 and the energy recovered during phase 2, 3 and 4.

Phase 1 : starting (0 to 20 seconds). The energy needed to accelerate the vehicle through the 800kW traction motor (71) is equal to ((400kW * 5sec) + (800kW * 15sec)) = 14MJ or 3.8kWh. (FIG 2.a.)

During phase 1, the super capacitors (61) of the onboard energy storage (60) give a maximum power of 650kW and the external power supply (10) a power lightly higher than 150kW in order to feed the traction motors (71) with 800kW.

The energy given by the super capacitors (61) while phase 1 is equal to ((375kW * 5sec) + (650kW * 15sec)) = 11.6MJ or 3.2kWh. (FIG 2.b.)

This energy will be recovered by the super capacitors (61) while phase 2, 3 and 4.

Phase 2 : cruising (20 to 40 seconds). While the said traction chain of the vehicle consumes no or little energy, the onboard energy management computer (85) recharges

the super capacitors (61) through the electrical converters (84) and (81) using the external power supply source (10) to take the energy. The energy recharge is equal to (150kW * 20sec) = 3MJ or 0.83kWh. (FIG 2.b.)

Phase 3 : breaking (40 to 60 seconds). While breaking, the onboard energy management computer (85) recharges the super capacitors (61) through the electrical converter (84) with energy breaking from electrical converter (72) and energy from the external power supply source (10) through (81). The energy recharge is equal to ((400kW * 10sec) + (200kW * 10sec)) = 6MJ or 1.67kWh. (FIG 2.b)

Phase 4 : stop at the station (60 to 90 seconds). The onboard energy management computer (85) recharges the super capacitors (61) through the electrical converters (84) and (81) using the external power supply source (10) to take the energy. The energy recharge is equal to (150kW * 20sec) = 3MJ or 0.83kWh. (FIG 2.b.)

At the time 80 second the super capacitors (61) are full, the charge is stopped by the computer (85) and the power taken from the external power supply (10) is null (except energy for auxiliaries like light, air cooled, ...).

Total recovered energy while phase 2, 3 and 4 is (0.83kWh + 1.67kWh + 0.83kWh) = 3.3kWh lightly higher than 3.2kWh needed for phase 1.

As mentioned, the invention enables to power a powerful vehicle (800kW in this example) with an reduced external power supply (150kW in this example).

<u>Answer to claim Rejection (page 4 points 10, 11 and 12)</u>

Analysis of documents cited:

1. Analysis document Kurtz (FR2825666) - June 2001

Kurtz indicate that the vehicle (VF) did not exceed 10 tons (see page 6 line 9) because of the limited power of the power supply (Mi, Mi+1). The voltage is 60V maximum (see page 11 line 7) and the current is 1000A maximum (see page 11 line 10 and FIG. 2.f. sheet 3/7).

As a result, with an external power supply of 60kW maximum Kurtz motorise a 10 tons maximum vehicle using a 60kW motor. Here the motor is directly supplied by the external power supply (see FIG.1. sheet 1/7).

Kurtz (see FIG2.f. sheet 3/7) shows that the external power supply gives energy to the motor of the vehicle only while the starting phase.

The present invention is different.

The application (please see FIG2.c. sheet 2/5) shows that the vehicle (30) takes and manages energy while the starting phase of course and while coasting, braking and stopping at the station.

So with the same external power supply the energy storage system described in this invention can give up to 4 times more energy to the vehicle than Kurtz's invention.

For example, with an external power supply (10) of 60kW, the present invention can motorise a 40 tons vehicle (30) using a 240kW traction motor (71) and using an onboard energy storage (60) managed by a computer (85).

Please note that Kurtz knows onboard energy storage (page 2 line 29), Kurtz knows super capacitors (page 3 line 29) but Kurtz did not think to use it to motorise vehicle higher than 10 tons.

2. Document Blackman (US3637956) - January 1972

Blackman indicates that when there is lack of contact with the electrified road the relay contact (74a, 74c) opens and the relay contact (74b) closes to complete an energizing circuit between the motor and the vehicle propulsion battery (24). Under these conditions, the vehicle operates in its internally powered mode, wherein the vehicle motor (22) is powered by the vehicle battery (24). (see col.6 lines 29 to 39 and sheet 2/2 FIG.8)

Blackman indicates that when the relay (74) is energized from the electrified road (34, 36) through the vehicle current collecteur wheels (38, 40) with the main motor switch (82) closed, the vehicle propulsion motor (22) and the voltage regulator (88) are connected in electrical parallel to and must receive electrical energy from the road conductors through the collector wheels. The electrical energy thus supplied to the vehicle charges its battery (24) through the voltage regulator (88) and simultaneously powers its propulsion motor (22) to permit driving of the vehicle during the battery charge (see col.6 lines 10 to 24 and sheet 2/2 FIG.8.)

At no time the external power source and the onboard storage mean do they act simultaneously to feed the traction chain with more electrical power.

Blackman didn't add the electric power of an onboard energy storage with the electric power of the external power supply in order to increase the power sent to the vehicle's motor.

Blackman didn't use super capacitors and an energy management computer.

Blackman uses commutators, that either use the external power or the battery but never combine the two energies together for higher power supply.

3. Batisse document (US6557476) - January 2002

Batisse indicates that the tram (2) begins to leave the station (1) and during this phase the traction motors (3) are powered by the overhead line (7) and mainly receive energy from the energy accumulator kinetic system (9) and to a lesser degree, energy supplied by the electrical power supply network (10) of the station. During this starting phase, the overhead line (7) is also used to maintain the charge in the battery of super capacitors (6).

When the tram (2) is accelerating and the pantograph (5) reaches the end of the overhead line (7), which advantageously corresponds to the tram (2) reaching its cruising speed, the power circuit (4) detects the interruption in the supply of energy from the overhead line (7) and then commands the supply of energy to the traction motors (3) by the autonomous power supply system (6) until the tram reaches the next station (1) (see col.3 line 65 to col.4 line 14).

As a result Batisse didn't add the electric power of the onboard energy storage (6) with the electric power of the external power supply (9) and (10) in order to increase the power sent to the vehicle's traction motor (3).

Batisse uses battery of super capacitors (6) but did not use and energy management computer to charge the onboard energy storage (6) when cruising.

Batisse needs an energy accumulator kinetic system (9) to power the tram (2) while starting because the electrical power supply (10) of the station in not enough powerful.

In conclusion, none of the documents cited describe a solution like the present invention where a vehicle (30), with an onboard energy storage (60) composed of super capacitors (61), is used with an onboard energy management computer (85), which discharges the super capacitors (61) to power the traction motor (72) of the vehicle (30) when starting, and to charge the super capacitors (61) while cruising, breaking and stopping, allowing to significantly increase the power of the vehicle or to significantly reduce the power of the electrical power supply (10) at the station.

I hope this answers your questions and I have modified the claims accordingly:

Claims have been currently amended.

Best regards,

Herve AFRIAT